Original article

Egalitarianism in surgical training: let equity prevail

David BT Robinson[a,b] , Luke Hopkins[a,c], Osian P James[a,d], Chris Brown[a], Arfon GMT Powell[e], Tarig Abdelrahman[a], Sarah Hemington-Gorse[a,c], Leona Walsh[f], Richard Egan[a,c], Wyn G Lewis[a,g]

[a] Wales PGMDE School of Surgery, Health Education and Improvement Wales, Cefn Coed, Nantgarw, CF15 7QQ.

[b] Royal Glamorgan Hospital, Cwm Taf Morgannwg UHB, Ynysmaerdy, Llantrisant, CF72 8XR

[c] Morriston Hospital, Swansea Bay UHB, Heol Maes Eglwys, Swansea, SA6 6NL

[d] Royal Gwent Hospital, Aneurin Bevan UHB, Newport, NP20 2UB

[e] Division of Cancer & Genetics, Cardiff University, Heath Park, Cardiff, CF14 4XW

[f] Professional Support Unit, Health Education and Improvement Wales, Cefn Coed, Nantgarw, CF15 7QQ.

[g] University Hospital of Wales, Cardiff and Vale UHB, Heath Park, Cardiff, CF14 4XW

Correspondence to: Mr David Robinson, Wales PGMDE School of Surgery, Health Education and Improvement Wales, Cefn Coed, Nantgarw, CF15 7QQ.

E: david.robinson4@outlook.com

F: 029 2074 4553

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Abstract (Words = 249)

Purpose of the study: This study aimed to quantify Core Surgical Trainee (CST) differential attainment (DA) related to three cohorts; White UK Graduate (White UKG) vs. Black and Minority Ethnic UK Graduate (BME UKG) vs. International Medical Graduates (IMG). The primary outcome measures were annual review of competence progression (ARCP) outcome, intercollegiate membership of the Royal College of Surgeons (iMRCS) examination pass, and National Training Number (NTN) selection.

Study Design: Intercollegiate Surgical Curriculum Programme (ISCP) portfolios of 264 consecutive CSTs (2010 to 2017, 175 White UKG, 89 BME UKG, 30 IMG) from a single UK regional Post Graduate Medical region (Wales) were examined. Data collected prospectively over an eight year time period was analysed retrospectively.

Results: ARCP outcomes were similar irrespective of ethnicity or nationality (ARCP outcome 1, White UKG 60.7% vs. BME UKG 62.1% vs. IMG 53.3%, p=0.395). iMRCS pass rates for White UKG vs. BME UKG vs. IMG were 71.4% vs. 71.2% vs. 50.0% (p<0.042) respectively. NTN success rates for White UKG vs. BME UKG vs. IMG were 36.9% vs. 36.4% vs. 6.7% (p=0.023) respectively. On multivariable analysis, operative experience (Odds Ratio (OR) 1.002 (95% CI 1.001-1.004) p=0.004), Bootcamp attendance (OR 2.615 (1.403-4.871) p=0.002), and UKG (OR 7.081 (1.556-32.230) p=0.011), were associated with NTN appointment.

Conclusion: Although outcomes related to BME DA were equitable, important DA variation was apparent among IMGs, with iMRCS pass 21.4% lower, and NTN success 6-fold less likely than UKG. Targeted counter measures are required to let equity prevail in UK CST programmes.

Main messages

- Differential Attainment refers to systematic differences in outcomes when classifying cohorts by protected or socio-economic characteristics.
- The biggest disparities in achievement during medical training are linked to race, with both UK Black and Ethnic Minority (BME), and International Medical Graduates (IMG) affected, and evident across all medical specialties.
- In this study, no variation was found related to ethnicity or gender for any of the primary outcome measures; ARCP, NTN selection, or iMRCS pass however DA was evident among IMGs when compared with UKGs.
- IMGs were two-fold more likely to receive ARCP Outcome 2 or 3, a fifth less likely to pass iMRCS, and six-fold less likely to be successful at NTN selection when compared with UKGs.

Future/current research questions

- What counter measures need to be implemented to ensure equality of outcomes between UKGs and IMGs?
- Is the proposed introduction of professional support to IMGs based on this retrospective data going to be the answer?
- Given the UK-wide outcome variations between IMGs and UKGs in this study and the wider literature, does a central support network need to be introduced to aid accusation of non-technical skills among IMGs?

Introduction

Egalitarianism, otherwise known in modern medical parlance as Differential Attainment, according to the General Medical Council (GMC), refers to systematic differences in outcomes when classifying cohorts by protected or socio-economic characteristics. The biggest disparities in achievement during medical training are linked to race, with both UK Black and Ethnic Minority (BME), and International Medical Graduates (IMG) affected, and evident across all medical specialties.[1] In 2018, GMC data reported the pass rate in postgraduate examinations was 77.3% among white UK graduate (White UKG) students compared with 65.5% among BME UK graduates (BME UKG). Among IMGs, the pass rate was 46.3% for white students compared with 44.7% for BME students.[2]

The GMC's annual National Training Survey (NTS) has reported that UK Core Surgical Trainees (CST) are among the least satisfied with overall rates of satisfaction of 77.2% compared with anaesthesia (85.6%), and general practice (88.6%).[3] Moreover, recent NTS data suggest that only 56% of those in CST programmes progress to specialist surgical training, including those taking a training break. One theme that is likely to contribute to such dissatisfaction is burnout, and a recent report from Health Education and Improvement Wales' (HEIW) School of Surgery found that core surgical trainees were at most risk.[4] It is therefore plausible, based on the aforementioned, that differential attainment may also be an important factor contributing to the high levels of dissatisfaction.

As a leading academic in this area, Dr. Katherine Woolf contends that attainment should be interpreted broadly, covering academic performance in examinations, postgraduate progression (Annual Review of Competence Progression [ARCP]) and recruitment outcomes and that differential attainment is present in each of these

domains across all specialities.[5] The aim of this study was to quantify DA in terms of ethnicity and gender among UK core surgical trainees with regard to ARCP outcomes, academic achievement, success at intercollegiate Membership of the Royal College of Surgeons (iMRCS) examination, and selection into specialty surgery National Training Number (NTN) programmes. The hypothesis was that variations in outcomes would be identified related to ethnicity or graduate status (White UKG vs. BME UKG vs IMG), and gender (male vs. female). The setting was a UK regional Post Graduate Medical & Dental Education region, Health Education and Improvement Wales (HEIW) tasked with the pastoral care of 3,000 postgraduate trainees.

Material and Methods

Two hundred and sixty-four trainees (192 male, 72 female, 168 White UKG, 66 BME UKG, 30 IMG) enrolled into CST between August 2010 and August 2017 (completing CST between 2012 to 2019), in eight annual cohorts. The trainees' Intercollegiate Surgical Curriculum Programme (ISCP) portfolios and curriculum vitae (CV) were assessed over their two-year CST period to completion. Variations in ARCP outcomes were obtained as well as NTN selection success, iMRCS success, and CST attrition rates were recorded. Specific reference was paid to the volumes of surgical operations performed, workplace-based assessments (WBA), audits, communications to learned societies, and scientific publications. ISCP data were obtained by generating a Head of School trainee report for each training post. Formal permission under the ISCP Data Governance Structure was not required because the study represented service evaluation.

Non-UK graduates

The 30 non-UK graduates (27 BME IMG vs. 3 white IMG) obtained their primary medical degree from a combined 16 different countries; Spain, Libya, Malta, Romania, Italy, Austria, Iran, Iraq, Egypt, Jordan, Sudan, Bulgaria, Slovakia, Cayman Islands, Mauritius and India. Due to the small number of white IMG in the cohort (1.1% of the cohort), IMG were analysed as a single cohort comprising both white and BME trainees who obtained their primary medical qualification outside of the UK.

ARCP outcomes

Percentage outcomes and crude number of trainees achieving the separate ARCP outcomes are not the equivalent to the overall number of trainees in each arm as all individuals had at least two ARCPs and as such some may have received a combination of outcomes thus fall into multiple categories. ARCP outcomes include the following: Outcome 1 – Satisfactory progress; Outcome 2 – Development of specific competencies required, additional training time not required; Outcome 3 – Inadequate progress, additional training time required; Outcome 4 – Released from training programme, with or without specified competencies. For the purposes of data analysis outcome 6 (Achieved all competences and eligible for completion of core surgical training) has been incorporated into universal outcome 1 for those trainees who have completed CST as both represent satisfactory progress.[6] Other outcomes are available at ARCP but the ones outlined are the only ones pertinent to this study.

Professional Support Unit

The Professional Support Unit (PSU) is a service available to HEIW trainees providing guidance and support with issues that may arise during an individual's training, whether personal or professional. The PSU may be utilized as an

intervention should issues arise regarding career progression and ARCP outcomes, related to differential attainment. The subsequent career progression of trainees who had availed themselves of PSU support was analyzed, to determine and validate the worth of this service as a potential intervention and counter measure. PSU was not mandated for any trainee however was offered to those individuals who were struggling. Alternatively, the service can be accessed via a self-referral from a trainee. To ensure trainee anonymity, all data regarding contact with PSU were anonymized prior to being available for analysis.

Statistical Analysis

Statistical analysis appropriate for non-parametric data was performed with data collected and analyzed in SPSS version 25 (SPSS, IBM Corp, Armonk, NK, Chicago, IL). Three separate multivariable analyses were performed, one for each of the primary outcome measures.

Results

Within the study cohort the overall rates of universal ARCP Outcome 1, NTN selection, and iMRCS success were 60.2%, 33.3% and 68.9% respectively.

Variations in ethnicity

Table 1 illustrates the variations between White UKG, BME UKG and IMG trainees with regard to the aforementioned outlined variables. Significant variations were seen when comparing national outcomes (NTN success and iMRCS) of IMG with both White and BME UKG's. This was less evident on a regional scale (ARCP outcomes) however IMGs had a significantly lighter operative logbook, fewer WBAs and fewer communications to learned societies. Figures 1 and 2 show the annual variability in trainee success rates at NTN selection and iMRCS pass related to

ethnicity. The NTN and iMRCS rates are reflective of the number of individuals entering CST during the study period. Of the 264 individuals included in the study, only 179 (67.8%) were eligible to obtain an NTN (ie received certificate of completion of training for CST), of which 88 (49.2%) were successful.

NTN appointment related to surgical subspecialty

Table 2 demonstrates the relative appointment rates of trainees from different ethnic cohorts at NTN selection related to surgical subspecialty, demonstrating variability. Appointment of white UKG as a percentage of the total appointment for each specialty ranged from 60.0% to 100.0% whereas BME UKG ranged from 6.7% to 40.0%. When compared with the total cohort represented by these ethnic clusters these figures were comparable across all specialties.

Differential attainment related to gender

Table 3 shows the equivalent data assessing differential attainment related to gender.

Professional Support Unit

Of the 264 trainees, 68 (25.8%) received targeted support from the PSU. This support addressed issues regarding examination failure (n=35), progression in training or non-outcome 1 ARCP (17), health (9), professionalism (3), GMC referral (2), and career uncertainty (2). PSU counter measures in individuals who were experiencing examination difficulties were associated with a 54.3% (19 trainees) subsequent success rate, and five trainees (29.4%) who had suffered set-backs with competence progression and adverse ARCP outcomes were subsequently awarded Certificates of Completion of CST (ARCP outcome 6). Engagement with PSU varied between White UKG, BME UKG, and IMG with 36 vs. 20 vs. 12 trainees (21.4% vs. 30.3% vs. 40.0%, r=0.141, p=0.022) receiving support respectively. The two IMG

trainees successfully appointed to NTN positions both received PSU input during core surgical training.

Multivariable analysis (MVA)

To identify factors independently associated with each of the primary outcomes, three Multi Variable Analyses were performed and the results can be found in table 4.

Discussion

This is the first study to assess differential attainment in a national training environment with compound metric outcome measures. The salient findings were that no variation was found related to ethnicity or gender for any of the primary outcome measures; ARCP, NTN selection, or iMRCS pass. But DA was observed related to IMGs when compared with UKGs. IMGs were two-fold more likely to receive ARCP Outcome 2 or 3, a fifth less likely to pass iMRCS, and six-fold less likely to be successful at NTN selection when compared with UKGs. Multivariable logistic regression highlighted that UKG training, operative experience, and induction Bootcamp attendance, to be associated with NTN appointment success. Finally, the worth of the PSU was validated, which had the most success in enhancing examination success with iMRCS pass rates boosted by more than half.

Clearly, a diverse workforce is associated with many benefits, including variation in perspective, development of different priorities among ethnic groups, and in the medical field, enabling medical professionals to relate and treat patients to the highest standards, regardless of ethnicity. Differential attainment is not unique to a single specialty nor is it solely a UK-based issue. Dr. Katherine Woolf has reported that differential attainment is not linked to a student's prior academic ability nor is

examiner bias likely to be the main cause, given that discrepancies between White, BME and IMG individuals have been identified in both machine-marked written assessments and practical clinical assessments.[7-9] Moreover, Dr Woolf's research has shown that positive interpersonal interactions are key for learning and achievement. Learning is a social activity and it is therefore arguably not surprising that in medicine the existence of strong peer support and networks influence performance significantly. Furthermore, it has been suggested that BME medical professionals have different and occasionally poorer relationships with their peers and educators when compared with their white colleagues, further contributing to potential issues related to isolation and lack of peer support structures.[8] Tiffen et al have also previously identified that IMGs have twice the odds of obtaining a less satisfactory ARCP outcome (odds ratio 2.46, 95% confidence interval 2.35 to 2.58) when compared to UKG which is comparable to the findings in this study.[10]

The influence of culture and language is another area that may be responsible or at least in part contributory to the poorer outcomes observed in the IMG population. Verma et al explored the communication skills of IMG candidates sitting the MRCP (UK) PACES examination in 2012, and reported that in general, IMG candidates were poor in their ability to detect cues and address concerns raised by patients in communication skills stations. Furthermore, IMGs experienced difficulties in building relationships with patients, providing structure to consultations and in giving clear explanations of suspected diagnoses. An understanding and awareness of such barriers should allow targeted interventions and support to be provided to IMG trainees, in order to improve their communication skills in day-to-day clinical practice, and to equip them with the best chance of success in UK based examinations.[11]

Not only have the above issues been identified in the medical literature, but have also been the focus of several legal proceedings. Following the joint publication of the Equality and Diversity Policy by the Royal College of Surgeons in response to the Equality Act 2010, and Standard 17 of the 2010 GMC standards for curricula and assessments, the British Association of Physicians of Indian Origin obtained a judicial review of the examination methodology employed by the Royal College of General Practitioners (RCGP). The review rejected the claim of unlawful conduct, but ruled that there was disparity in the results of different cohorts, and it was subsequently deemed that the RCGP should act to address.[12] In contrast, there have been multiple cases in the USA, where white applicants to USA-based medical schools have argued that appointment scoring systems display positive discrimination towards BME applicants. In all three major cases argued before the Supreme Court (Regents of University of California vs. Bakke 1978, Grutter vs. Bollinger 2003 and Fisher vs University of Texas 2012) the decision was made that although race cannot be used to solely appoint individuals to medical school positions, it can be used as a “plus” factor in the admissions process in order to achieve the benefits associated with educational and physician workforce diversity.[13,14]

This study has a number of inherent potential limitations. The data represents a single UK Post Graduate Medical & Dental Education region, and therefore outcomes may not be applicable globally. However, UK wide data shows that a third of medical students and UKGs are BME which is comparable with the figures in this study.[9] Furthermore, data for operative numbers and academic achievements rely on trainees uploading such data accurately to their online portfolios (ISCP). When making multiple comparisons, there is an increased risk of type I errors, however,

this study limits tests to a maximum of 12 comparisons which is not considered excessive. As these are exploratory comparisons, it is felt that a correction was not indicated. In contrast the study has strengths. It represents a complete data set comprising 264 trainees over an 8-year study period with no individuals lost to follow up. The study has statistical power, and the data used to assess the primary outcome measures were all recorded, analysed, and ratified at Annual Review of Competency Progression [ARCP] appraisals.

In conclusion, although it was reassuring that overall early year surgical training outcomes related to BME DA were equitable, important variation emerged among IMGs. New policies to counteract the challenges faced by IMGs must be developed, focused on capabilities in practice, and related to operative experience, non-operative technical skills (communications skills in particular), and examination technique. Easy and ready access to regional Professional Support Units and targeted counter measures from the outset of their time in core surgical training, must also be mandated if equity is to prevail between trainees in UK CST programmes.

Competing interests and funding statement
There are no competing interests to declare for this study. This study was not directly funded by any organisation however OP James is supported by a Joint Surgical Research Fellowship from the Royal College of Surgeons of England and Health Education and Improvement Wales.

Exclusivity licence

Contributorship Statement

DR - data acquisition and analysis, drafting, final approval and submission

LH - data interpretation, drafting and final approval

OJ – data interpretation, drafting and final approval

CB – data interpretation, critical revision and final approval

AP – data interpretation, critical revision and final approval

TA – data interpretation, critical revision and final approval

SHG – data acquisition, critical revision and final approval

LW – data acquisition, drafting and final approval

RE – concept design, data interpretation, critical revision and final approval

WGL – concept design, drafting**,** final approval prior to submission, content guarantor

All authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Table 1: DA related to ethnicity and country of primary qualification

		White UKG (n=168)	BME UKG (n=66)	IMG (n=30)	p-value
ARCP Outcomes	**Universal Outcome 1**	102 (60.7%)	41 (62.1%)	16 (53.3%)	0.395
	Outcome 2	29 (17.3%)	11 (16.7%)	11 (36.7%)	0.161
	Outcome 3	24 (14.3%)	12 (18.2%)	8 (26.7%)	0.163
	Outcome 4	16 (9.5%)	5 (7.6%)	3 (10.0%)	0.732
NTN Success		62 (36.9%)	24 (36.4%)	2 (6.7%)	**0.023**
iMRCS pass		120 (71.4%)	47 (71.2%)	15 (50.0%)	**0.042**
Leave programme		31 (18.5%)	11 (16.7%)	4 (13.3%)	0.516
Median (range) operative cases		493 (68-1020)	520 (108-1176)	338 (64-728)	**0.001**
Median (range) WBAs		115 (11-249)	138 (31-314)	76 (40-200)	**0.002**
Median (range) Audits		3 (0-14)	4 (0-12)	2 (0-7)	0.068
Median (range) communications to learned societies		3 (0-26)	3 (0-31)	1 (0-6)	**0.014**
Median (range) publications		0 (0-11)	0 (0-10)	0 (0-8)	0.051

Table 1: Results are based on correlation studies and Kruskal-Wallis tests. Results are reported as number of individuals or medians with percentages or ranges in parentheses. p-value in bold indicates significance. UKG – UK graduate; BME – Black and Minority Ethnic; IMG – International Medical Graduate; ARCP – Annual Review of Competence Progression; NTN – National Training Number; iMRCS – Intercollegiate Member of the Royal College of Surgeons; WBA – Workplace-based assessment

Table 2: NTN specialty appointment related to ethnicity

	GS (29)	T&O (18)	ENT (16)	Urol (6)	Plastics (5)	OMFS (5)	Vasc (6)	Neuro (1)	Radiol (2)
White UKG	21 (72.4%)	11 (61.1%)	11 (68.8%)	5 (83.3%)	3 (60.0%)	4 (80.0%)	6 (100%)	0 (0%)	1 (50.0%)
BME UKG	8 (27.6%)	6 (33.3%)	4 (25.0%)	1 (6.7%)	2 (40.0%)	1 (20.0%)	0 (0%)	1 (100%)	1 (50.0%)
IMG	0 (0%)	1 (5.6%)	1 (6.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 2: Results are reported as number of individuals with percentage of total allocation to that specialty in parentheses. Total number of appointments into each specialty are in the parentheses adjacent to the specialty name. BME – Black and Minority Ethnic; UKG – United Kingdom Graduate; IMG – International Medical Graduate; GS – General Surgery; T&O – Trauma and orthopaedics; ENT – Ears, Nose and Throat; Urol – Urology; OMFS – Maxillofacial Surgery; Vasc – Vascular surgery; Neuro – Neurosurgery; Radiol – Radiology

Table 3: Differential attainment related to gender

		Male (n=192)	Female (n=72)	p-value
ARCP Outcomes	**Universal Outcome 1**	118 (61.5%)	41 (56.9%)	0.800
	Outcome 2	39 (20.3%)	12 (16.7%)	0.614
	Outcome 3	30 (15.6%)	14 (19.4%)	0.363
	Outcome 4	21 (10.9%)	3 (4.2%)	0.107
NTN Success		64 (33.3%)	24 (33.3%)	0.949
iMRCS pass		135 (70.3%)	47 (65.3%)	0.845
Leave programme		32 (16.7%)	14 (19.4%)	0.598
Median (range) operative cases		493 (64-1131)	462 (93-1176)	0.769
Median (range) WBAs		116 (11-297)	120 (45-314)	0.220
Median (range) Audits		3 (0-14)	4 (0-11)	0.206
Median (range) communications to learned societies		3 (0-31)	2 (0-18)	0.914
Median (range) publications		0 (0-11)	0 (0-6)	0.960

Table 3: Results are based on correlation studies and Mann Whitney U tests. Results are reported as number of individuals or medians with percentages or ranges in parentheses. ARCP – Annual Review of Competence Progression; NTN – National Training Number; iMRCS – Intercollegiate Member of the Royal College of Surgeons; WBA – Workplace-based assessment.

Table 4: Multivariable analysis of factors associated with the primary outcome measures

	OR	95% CI	p-value
Universal outcome 1			
Total Cases	1.002	1.001-1.004	**0.002**
iMRCS success			
Total Cases	1.004	1.002-1.006	**<0.001**
NTN success			
Total Cases	1.002	1.001-1.004	**0.004**
Boot camp	2.615	1.403-4.871	**0.002**
UKG	7.081	1.556-32.230	**0.011**

Table 4: Three separate binary logistic regressions have been run for each of the primary outcome measures. Only variables in the equation have been included in the table. OR – Odds Ratio; CI – Confidence Interval; NTN – National Training Number; iMRCS – Intercollegiate Member of the Royal College of Surgeons; UKG – United Kingdom Graduate.